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Highlighting of the Algerian experience in the integrated management of water resources

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Abstract

Water in Algeria is an element of survival. It strongly influences the social and economic development. It is reported that Algeria has become aware of the need and urgency to change its water policy. Like many countries, the new policy focuses on integrated management of water resources. Thus, the strategic nature of the water sector in Algeria, constantly reminded by the acuity, should justify the maintenance of a high level of investment by the Algerian state. The availability of multilateral financing offers additional flexibility to the Algerian authorities to carry out their policy. Through this work we attempted to describe and analyze the experience of Algeria in the management of water and confirm that integrated water management requires a proper coordination with the planning policy. For this, scientific and financial resources are essential.

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Introduction

Algerian territory extends over 2.4 million km². From north to south, there are three very contrasting sets, different in topography and morphology. Firstly, the chain of Tell and the coast, then the Atlas Mountains along the High Plains further south, finally, the Sahara desert, which extends beyond the Atlas Mountains (Fig 1). It is this provision of the relief with the weather, determines the potential agricultural and water resources of the country (UNDP, 2009).

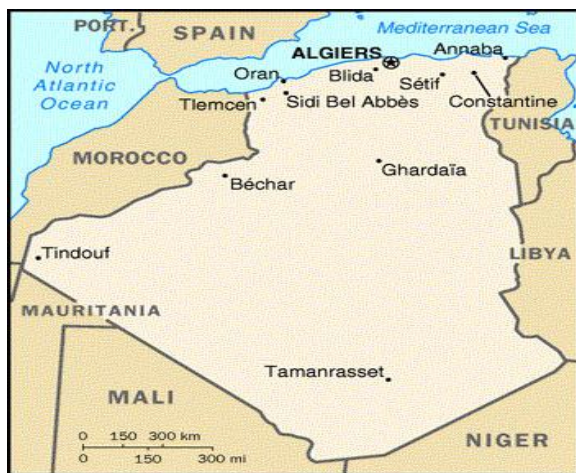


Fig 1. Map indicating the geographical position of Algeria (SI, 2007).

Water resources are meant to face major challenges caused by a significant rainfall deficit and their rarity on the one hand, and by their geographical distribution variable on the other hand. This issue is becoming so worrying that it requires an efficient as well as effective care and support in order to ensure a regular supply of water of different users. As such, the economic recovery plan initiated in 2001 by the Algerian Government and the investment and development of the water sector program that occupies an important place in the five-year program (2010-2014) (NRP, 2010), would benefit in the sense that they will be accompanied and accomplished by the adequate measures in terms of management of the public services, by scientific research actions, and technological development that could have generally a positive impact on water resources.

In the field of mobilization and distribution of drinking water, water purification, desalination of sea water, protection of resources, the efforts undertaken by Algeria, during the decade, including the last five years, have helped to record remarkable improvements. All efforts undertaken, both in terms of investment, than on the institutional and organizational level, were articulated around the development of this resource to meet the challenges and be in harmony with the Millennium Development Goals in the water sector. The aim of this study is to summarize the results obtained in this field during the last years and provide an overview of the Algerian experience in managing water resources in a sustainable development perspective.

Water Resources

The country is divided into five hydrographical watersheds gathering the 19 watersheds in the country (Fig 2) (AQUASTAT, 2005). Except few coastal streams, the only river in Algeria is that of Cheliff (725km) which derives its source from the Tellian Atlas and flows into the Mediterranean. There is no permanent river in the south of the Tell region. The lakes that spread over the desert regions are temporary ones, salty most of the time (Chott Chergui, Chott el Hodna) (Haddad and Rahla, 2004).

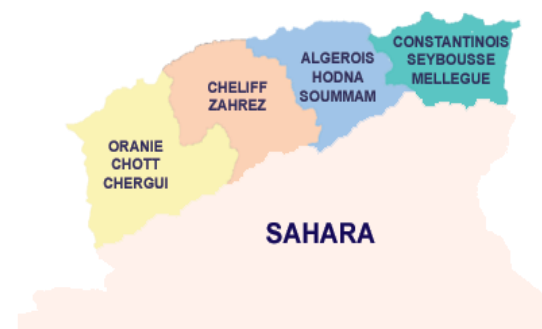


Fig 2. Map of the five regions of hydraulic planning (EMWIS, 2014).

Conventional Resources

The renewable superficial internal water resources constitute of about 10 billion m³/ year for the whole country in which the Sahara, the largest watershed,

contains only 0.2 billion m³. The renewable underground water resources contained in the north aquifers of the country are estimated at nearly 2 billion m³/ year (IR, 2008).

The south of the country is characterised by considerable underground water resources coming from Albian aquifers. The latter constitute important reserves, non-renewable and characterised by physical and geological constraints. So, it is a fragile heritage which necessitates a rational management for its sustainability (Haddad and Rahla, 2004).

The studies show that on a potential of 40000 billion m³, 5 billion can be exploited annually and this, without an impact on the sustainability of these aquifers.

If we consider that there is no common part between superficial and underground water, the total internal renewable resources rise to 12 billion m³ /year (IR, 2008). In North of Algeria, the main contribution comes from the runoff. The Surface water is stored in dams (Fig 3).

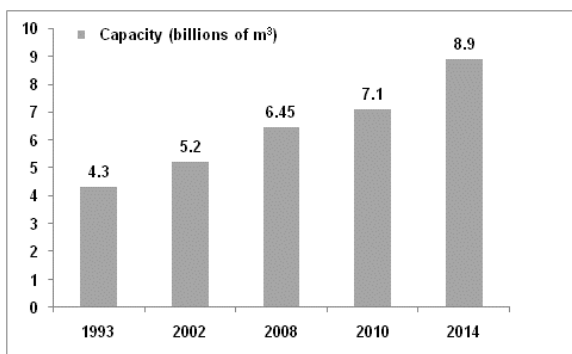


Fig 3. Dams' capacity in Algeria from 1993 to 2014.

During the last five years, the global rates of dams filling in operation has progressed regularly to reach 33.94% in 2006, 40.21% in 2007, 48.26% in 2008, 60.84% in 2009, 65.17% in 2010 and to 83,90% in 2014, for the same reference month (APS, 2010; Meslem, 2014).

Currently, the total reserve of superficial usable water resources in dams in operation is around 4 billion m³ being a filling rate of 68%.

The Non-Conventional Resources

In order to reinforce the security of the water supply of big Algerian cities and coastal areas, the water desalination is another possible option. The water desalination stations were first integrated in the infrastructure of water resources through an emergency program. Therefore, twenty-one (21) integral stations have been made in 2003 so as to provide drinking water. Nine (09) remaining desalination stations would be operational in 2011. All combined should provide of about 2.3 million m³ per day (NRP, 2010).

In Algeria, the rehabilitation and the construction of purification water stations has permitted the treatment of wastewater. Therefore, the treatment involves firstly the cities over 100.000 inhabitants, settlements situated upstream dams (whether in operation or in construction) and the coastal towns. The number of treatment water stations achieves to date one hundred and two (102) units, with a capacity of a 600 million m³ per year. The treated wastewater is the alternative to develop lands especially in water-deficient regions. It would be a solution to recharge artificially groundwater being overexploited and coastal aquifers experiencing salinity.

Water Needs

With regard to the existing mobilised resources, the exerted samples on water resources appear important. It has been estimated at nearly 4.2 billion m³, of which 78% come from groundwater. The collected water resources are consumed to nearly 60% by agriculture and the remaining by the alimentation network of drinking water and industry. However, it should be noted these samples include significant losses related to the age of distribution system of drinking water and irrigation. These losses are estimated at nearly 570 million m³ in 2003 (Ferrah and Yahiaoui, 2004).

These needs have increased recently along with water demands corresponding to 5 billion m³ annually with an endowment of 170m³/habitant/year. This consumption is below 250 m³/habitant/year, a global standard provided by WHO. According to hydrologists, this level already corresponds to a deficiency state.

National Strategies for Integrated Water Management in Algeria

The new Algerian policy in terms of mobilisation, transfer and management of water resources inspired from the land use policy based on the following principles: (i) resource sustainability; (ii) priority satisfaction of needs in drinking water and industry, (iii) food security; (iv) protection of water resources and environment; (v) creation of dynamic rebalancing planning and good governance (IR, 2008).

In addition, Algeria predicts the establishment of action program, in its Initial National Communication in order to cope with climate change. Concerning water, this program will include soil conservation, protection, conservation and forestry extension and the establishment of watersheds and should conduct two types of actions: the optimal management and water resources economy (MSPE, 2001).

Laws and Water Management Institutions

The Water Code had not been promulgated till 1983, reflecting a belated realisation of the hydraulic importance in the economic and social development process (Haddad and Rahla, 2004). As far as the water sector is concerned, the main laws that were promulgated are the following:

Law No. 85-05 of February 15th, 1985 relating to the protection and improvement of health; Acts No. 90-08 of April 17th, 1990 and No. 90-09 of April 27th, 1990 relating to the township and the wilaya that define their competencies in terms public water services; Law No. 05-12 of August 4th, 2005 related to water and Law No. 08-03 of January 23th, 2008

amending and supplementing Law No. 05-12 related to water.

In 2010, the Executive Decree No. 10-01 of January 4th, 2010 was promulgated which is related to water resources development plan and the national water plan.

The Ministry of Water Resources (MWR) along with its six affiliate administrations are the most active in the management of water resources.

At the local level, in each wilaya, the MWR has a hydraulic steering.

At the intermediate level, the MWR has three branches: the National Agency for Water Resources, the National Agency for Dams and the National Agency for Implementing and Managing Water Infrastructure for Irrigation and Drainage; and five River Basin Agencies created in 1996 which are responsible for the integrated management of water resources that rely on basin committees.

In addition to the offices of irrigated areas, the National Water Council (NWC) (coordination and control) and the Ministries of Agriculture and Fisheries, and the Spatial Planning and the environment (IR, 2008).

Drinking Water Supply (DWS) and sanitation are also provided by the Algerian for Water Company (AWC), and the National Office of Sanitation (NOS), created in 2001).

Overview of the Current Situation of Irrigation, Sanitation and Water Supply

The stimulus program in the field of agriculture will create a new application needing irrigation. Indeed; the area equipped of infrastructure irrigated is 220000 ha. It should be noted that more than 157000 ha have been developed during the last decade (2000-2009).

Small and medium irrigation schemes cover an area of 900000ha. Their peculiarity is the nature of water

resources mainly extracted from ground water resources. In addition, Algeria has a fleet of small dams that includes more than four hundred (400) structures. It should be noted that more than hundred deductions were made during the last decade (2000-2009). These structures allow to mobilize more than fifty (50) million m³ and to irrigate an area of 10000 ha (NRP, 2010).

The attachment of urban population in public network has reached 86% in 2009 (Fredj and Silhadi, 2005). Sewerage systems have reached a linear of 40000 km. Among the most important projects. It should be noted that concerning sanitation and protection works against the flooding of the valley of M'Zab and cities of Sidi Bel Abbés and of Tebessa as well as works to fight against rising of water in regions of Eloued and Ouargla in the South (NRP, 2010).

The rate of urban population attachment in public of drinking water is of 93% in 2009 with an average allocation of 170 liters per day per capita .these results have been obtained due to the achievement of much abduction from dams and aquifers and rehabilitation networks of drinking water of cities.

Meanwhile, following the implementation of improvement policy of performance of operators, water management and sanitation in the capital and

Table 1. Investment Schedule According to the Director of Large Hydraulic Infrastructures Scheme (IR, 2008).

Type of investment (million U.S. \$)					
	Agricultural Water Supply	Drinking water supply	Sanitation and sewage treatment	Mobilization of water resources	Total
Short term	1530	7470	1770	15920	26690*
Middle term	960	1940	940	2850	5844
Long Term	-	330	1470	530	2330
Total	2490	9740	4180	19300	35710

* Including budget already mobilized - U.S. \$ 22.5 billion.

Through this scheme, the Algerian state planned the achievement of the following projects: the construction of 16 dams across the country for an additional capacity of 1.8 billion m³, the major project is intended to transfer water of Ain Salah to Tamanrasset (770 Km) (approved in March 2011), Mostaganem-Arzew-Oran (put in operation in July

three other cities (Oran, Constantine, Annaba) has been delegated to corporations whose management was entrusted to international operators of renowned on the basis of contracts objective including the transfer of know-how.

The pricing of water is administrated by regulation. In this regard, it should be remembered that the cubic meter of water is charged on the basis of governmental instructions and a selective progressive system that generates an overall subsidized portion of the order of 45-50% and does not take into account the real cost of water, varies from one region to another (Haddad and Rahla, 2004).

However, a new pricing system was established based on areas criteria and the importance of consumption. Thus, the average pays of citizens is 19 DA/m³ while the true cost can reach 150 DA/m³ in some areas.

Major Completed or Underway Projects in the Hydraulic Field

The investment for short, medium and long term is presented in the table below (Table1) and it is expressed in millions of US dollars. It has been established on the basis of the director of large hydraulic infrastructures scheme 2006-2025 (IR, 2008).

2009), the proposed transfer project towards high plains of Setif and the extension of Beni Haroun system achieving the interconnection of the five component blocks (APS, 2009).

The Outlook for Water Resources

The various components of the coming five-year program of water resources sector should contribute to the consolidation of the obtained results of the sector and sit in Algeria in which we can find a real and integrated management of water in its different domestic uses, agricultural and industrial. In this regard, the completion of 19 new dams and the elevation of another 4 are planned in order to achieve a mobilization capacity of 9.1 billion m³, the achievement of six major transfer projects and 14 drinking water suppliers, the rehabilitation of water supply systems for 22 cities and sewerage for 12 cities, increasing the number of seawater desalination plants to reach the capacity of 900 million m³/year in 2025, the construction of 44 sewage lagoons and 42 stations to reach a wastewater treatment capacity of 1.2 m³/year and the hydro-agricultural work on 60000 ha and the building of 174 small dams.

Conclusion

As a conclusion, it is quite safe to say that Algeria has made considerable efforts so as to achieve significant number of mobilization missions, transfer, treatment and supply of water resources to meet the growing demands for water for various uses. The importance of such investments over the last decade through different programs lies in the fact that these latter had led to satisfactory results in terms of meeting water needs in both quantity and quality. Finally, the Algerian experience in the field of water shows that the integrated water management involves actions which have to be coordinated properly with regard to land policy. Thus, water resources would be developed and maintained. For that reason, scientific, technical and financial resources are needed. Moreover, civic contribution remains a driving force in this management.

Acknowledgements

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